Utah Geological Survey
a division of
Utah Department of Natural Resources
in cooperation with
U.S. Geological Survey
STATEMAP Agreement No. 00HQAG109 and 99HQAG0138

PROGRESS REPORT GEOLOGIC MAP OF THE DUTCH JOHN QUADRANGLE (EAST PART) UTAH-COLORADO-WYOMING

Year 3 of 3

Compiled by Douglas A. Sprinkel
2002

Open-File Report 399
Plate 1

30 X 60 MINUTE SERIES (TOPOGRAPHIC)

SCALE 1:62 500
1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND
CONTOUR INTERVAL 50 METERS

DUTCH JOHN, UTAH–COLO.–WYO.
N4030–W10900/30 X 60

1981

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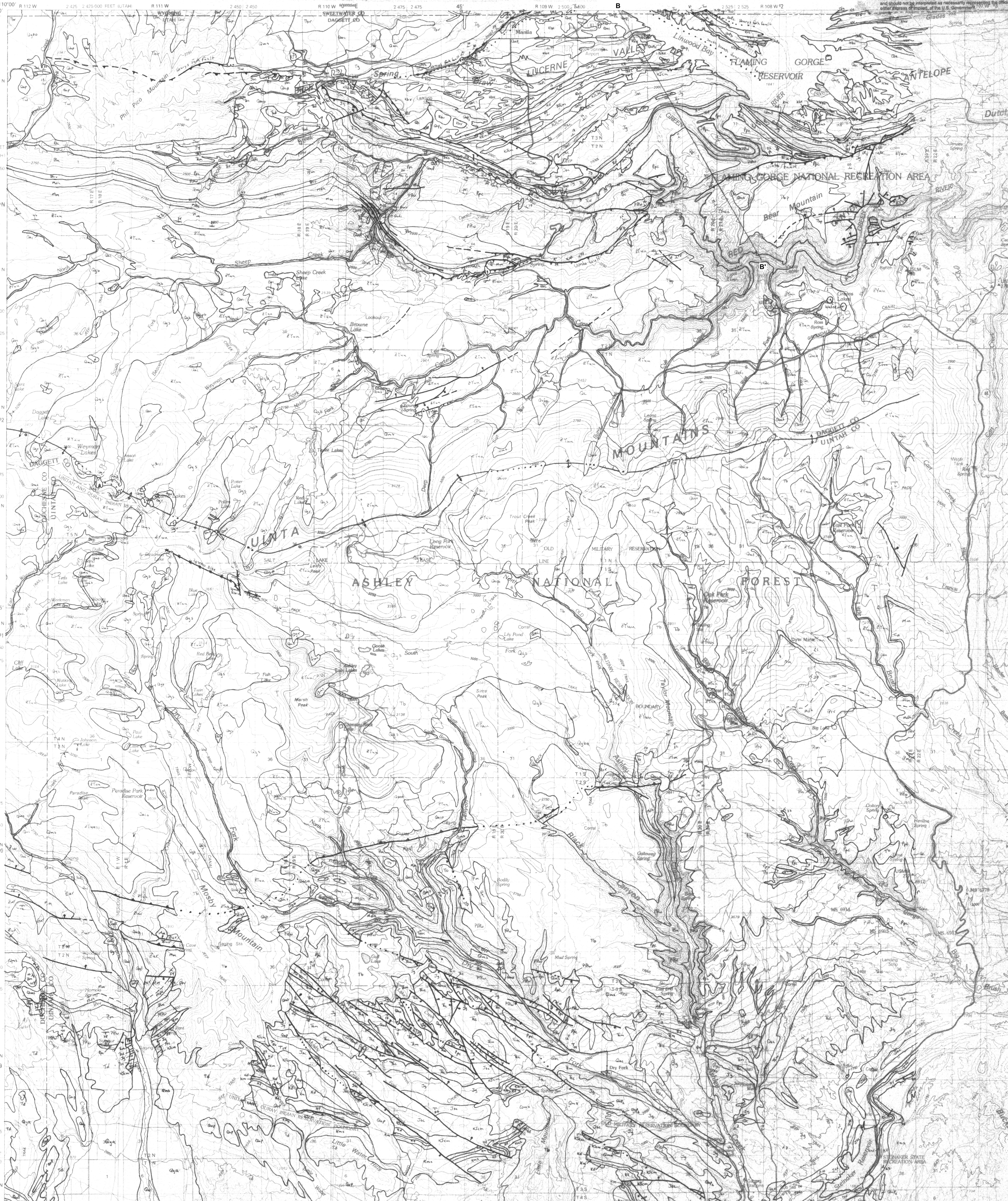
PROGRESS REPORT GEOLOGIC MAP OF THE DUTCH JOHN QUADRANGLE (WEST PART)
UTAH-COLORADO-WYOMING
Year 3 of 3

Compiled by Douglas A. Sprinkel
2002

Open-File Report 399
Plate 2

DUTCH JOHN, UTAH–COLO.–WYO.


B
B'
WYOMING
UTAH
SWEETWATER CO
DAGGETT CO
Phil Pico Mountain
Henrys Fork fault
Manila
LUCERNE
VALLEY
Linwood Bay
FLAMING GORGE
RESERVOIR
ANTELOPE
Dutch
GREEN
RIVER
FLAMING GORGE NATIONAL RECREATION AREA
Bear Mountain
RED
CANYON
Uinta fault
Sheep Creek
Sheep Creek Lake
Browne Lake
Spirit Lake
Daggett Lake
Weyman Lakes
Greens Lakes
Ross Spring
Leona Spring
MOUNTAINS
DAGGETT CO
UINTAH CO
DUCHESNE CO
UINTAH AND OURAY INDIAN RES
UINTA
SALT
LAKE
BASE
Leidy Peak
Long Park Reservoir
ASHLEY
NATIONAL
FOREST
OLD MILITARY RESERVATION LINE
Trout Creek Peak
East Park Reservoir
Oak Park Reservoir
Dyer Mine
Big Lake
Taylor Mountain
Marsh Peak
Chimney Rock Lake
Sims Peak
Paradise Park Reservoir
Paradise Peak
Mosby Mountain
Black Canyon
Galloway Spring
Bodily Spring
Mud Spring
Gull Lake
Dry Fork
Little Water Hills
UNITAH AND OURAY INDIAN RESERVATION BOUNDARY
OLD MILITARY RESERVATION BOUNDARY
Steinaker Reservoir
STEINAKER STATE RECREATION AREA
Big Brush
Landing Strip
Colton Spring
Henline Spring
Trout Spring
110°00′
41°00′
40°30′
45′
30′
R 112 W
R 111 W
R 110 W
R 109 W
R 108 W
R 17 E
R 18 E
R 19 E
R 20 E
R 21 E
R 22 E
R 1 W
R 1 E
R 2 E
T 3 N
T 2 N
T 1 N
T 5 N
T 4 N
T 1 S
T 2 S
T 3 S
T 4 S
225 000 FEET (UTAH)
800 000 FEET (UTAH CENTRAL)
2 425 000 FEET (UTAH)
2 425 000 FEET (UTAH CENTRAL)

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1982 86

West half labels
Phase III 2000-2001-2002

SCALE 1:100 000

KILOMETERS 1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

MILES 1 0 1 2 3 4 5 6 7 8 9 10 11 12 13

1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROU

CONTOUR INTERVAL 50 METERS

Utah Geological Survey
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00HQAG109 and 99HQAG0138

Progress Report Geologic Map of the Dutch John 30' x 60' Quadrangle, Utah-Colorado-Wyoming

Year 3 of 3

Compiled by Douglas A. Sprinkel

2002

Open-File Report-399

Plate 3

Description of Map Units

Qal Flood-plain alluvium (Holocene) - Unconsolidated silt, sand, and gravel in mostly the Green River flood plain; 1-30 m thick.

Qat Terrace deposits (Holocene) - Unconsolidated to locally cemented silt, sand, gravel, cobbles, and boulders; remnants of alluvial terraces; less than a few tens of meters thick.

Qaf_1 Younger alluvial-fan deposits (Holocene) - Unconsolidated, poorly sorted boulder, gravel, sand, and silt; less than 30 m thick.

Qac Mixed alluvium and colluvium (Holocene) - Unconsolidated mud, silt, sand, and gravel in tributary stream channels of the Green River, along smaller streams, and in other intermittent stream drainages. On the Mancos Shale, this unit is mostly reworked mud; less than 10 m thick.

Qae Mixed alluvium and eolian deposits (Holocene) - Unconsolidated alluvial mud, silt, and sand mixed with well-sorted, fine-grained, windblown sand and silt; less than 10 m thick.

Qe Eolian deposits (Holocene) - Unconsolidated, well-sorted, fine-grained, windblown sand and silt; less than 10 m thick.

Qc Colluvium (Holocene) - Heterogeneous mixture of boulders, gravel, cobbles, sand and silt that may grade into talus, landslide, and alluvial deposits; thin to a few tens of meters thick.

Qh Disturbed ground (Historical) - Modern gravel pit operation along the east flank of Phil Pico Mountain; material excavated is from unconcolidated deposits of Qap.

Qmf Debris-flow deposits (Historical) - Unconsolidated and poorly sorted heterogensous mixture of boulders, gravel, sand, silt, and mud; matrix supported; deposited in Sheep Creek Canyon on June 9, 1965 (Sprinkel, and others, 2000); less than 2 m thick.

Qmt Talus deposits (Holocene and Pleistocene?) - Unconsolidated and unstratified angular rock fragments that accumulate at the base of cliffs. Colluvium locally is a significant part of this deposit; less than 5 m thick.

Qgr Rock glacier deposits (Holocene and Pleistocene?) - Unconsolidated and unstratified angular rock fragments that accumulate at the base of headwall cirques; these deposits are likely cored by ice and have a "rumpled-carpet" look on aerial photographs. These deposits grade into talus deposits; less than 5 m thick.

Qms Slides, slumps and flows (Holocene and Pleistocene) - Earthflow and rotation slumps and slides in formations prone to slope failure; some Qms units share a common boundary with an adjoining mass movement.

Qap Pediment-mantle deposits undivided (Pleistocene) - Unconsolidated to poorly consolidated sand, gravel, cobbles, and boulders; weak soil profile with some pedogenic carbonate (caliche) developed on the underside of clasts; deposits are a few meters thick and preserved along the north and east flank of Phil Pico Mountain, north of Flaming Gorge, and near Whiterocks River; correlation with other pediment-mantle deposits uncertain.

Qap_1, Qap_2, Qap_3, Qap_4 Pediment-mantle deposits (Holocene and Pleistocene) - Unconsolidated to moderately consolidated, poorly sorted sand, gravel, cobbles and boulders; weak to strong soil profile developed in all four levels, and pedogenic carbonate (caliche) developed in upper 1 to 2 m of Qap_2 and older deposits; up to four levels are recognized with the topographically highest level (Qap_4) being the oldest. Pediment-mantle deposits on the north flank of the Uinta Mountains likely do not correlate with similarly numbered deposits on the south flank; in addition, map unit Qap_3 in Browns Park and unit Qap_2 in the Island Park 7.5-minute quadrangle may represent more than one age of pediment-mantle deposit.

Qaf_2 Older alluvial-fan deposits (Pleistocene) - Dissected, unconsolidated, poorly sorted boulder, gravel, sand, and silt; less than 10 m thick. Only mapped in the Island Park 7.5-minute quadrangle (Rowley and others, 1981).

Qgp Patterned ground (Holocene and Late Pleistocene) - Soil structures composed generally of fine-grained materials surrounded by unconsolidated boulders that are roughly arranged into polygon shapes less than 10 m in diameter; boulders are angular sandstone fragments of the unnamed formation of the Uinta Mountain Group; mapped on the saddle west of Leidy Peak; estimated less than 1 m thick.

Qg Glacial till, undivided (Late Pleistocene) - Unconsolidated and poorly sorted with angular to rounded boulders, cobbles, and pebbles to gravel of mostly red sandstone and quartzite (Uinta Mountain Group); generally forms small ridges and knolls that are mapped along the sides of lower Whiterocks Canyon on the south flank of the Uinta Mountains; age of glaciation has not been determined; 1-50 m thick.

Qga Glacial outwash, undivided (Late Pleistocene) - Unconsolidated, well-rounded, mostly red sandstone and quartzite (Uinta Mountain Group) boulders to pebbles and sand derived from the high-energy meltwaters of glaciers of undetermined age; less than 5 m thick.

Qgs Smiths Fork Till (Late Pleistocene) - Unconsolidated and poorly sorted with angular to rounded boulders, cobbles, and pebbles to gravel of mostly red sandstone and quartzite (Uinta Mountain Group); generally forms small ridges, knolls, and kettles with a smooth to hummocky unmodified surface with thin soils; Smiths Fork Till is correlated to Pinedale glaciation (Douglass, 2000; Munroe, 2001); 1-50 m thick.

Qgsa Smiths Fork outwash (Late Pleistocene) - Unconsolidated, well-rounded, mostly red sandstone and quartzite (Uinta Mountain Group) boulders to pebbles and sand derived from the high-energy meltwaters of Smiths Fork-age glaciers (Munroe, 2001); less than 5 m thick.

Qaco Older mixed alluvium and colluvium (Pleistocene) - Unconsolidated, poorly sorted, silt, sand, gravel, and cobble to boulder deposit; clasts are subangular to subrounded, mostly matrix supported with internal channel deposits; best exposed in the Dry Fork slide along the Dry Fork drainage where it underlies Smiths Fork Till; 0-300 m thick.

Qgb Blacks Fork Till (Late Pleistocene) - Unconsolidated and poorly sorted with angular to rounded boulders, cobbles and pebbles to gravel of mostly red sandstone and quartzite (Uinta Mountain Group); generally forms slightly modified small ridges, knolls, and kettles with a smooth to subdued hummocky surface with well developed soils; Blacks Fork Till is correlated to Bull Lake glaciation (Douglass, 2000; Munroe, 2001); less than 50 m thick.

Qgba Blacks Fork outwash (Late Pleistocene) - Unconsolidated, well-rounded, mostly red sandstone and quartzite (Uinta Mountain Group) boulders to pebbles and sand derived from the high-energy meltwaters of Blacks Fork-age glaciers (Munroe, 2001); less than 5 m thick.

Qgpb Pre-Blacks Fork Till (Late Pleistocene) - Unconsolidated and poorly sorted with angular to rounded cobbles and pebbles of mostly red sandstone and quartzite (Uinta Mountain Group); generally forms a subdued hummocky surface with very well developed soils; Pre-Blacks Fork Till is correlated to Pre-Bull Lake glaciation (Douglass, 2000; Munroe, 2001); less than 50 m thick.

Tng Old gravel deposits (Pliocene to Miocene?) - Unconsolidated to moderately consolidated, poorly sorted boulders, cobbles, pebbles, gravel, and sand that caps high-level erosion surface in Goslin Mountain 7.5-minute quadrangle; clasts consist of chert, limestone, and quartzite; may be correlative with the Browns Park Formation; maximum thickness is about 50 m.

Tbp Browns Park Formation (Miocene) - Light-gray and light-brown, poorly to moderately consolidated, cross-bedded sandstone; some tuffaceous sandstone; subordinate conglomerate, siltstone, and crystal-poor, glassy, rhyolitic air-fall tuff; in Colorado corrected K-Ar ages of about 8 to 25 Ma have been reported (Luft, 1985), but Barstovian fossils (Honey and Izett, 1988) indicate the formation is likely less than 17 Ma; probably no older than about 15 Ma (Hansen,1986); 0-500 m thick.

Tb Bishop Conglomerate (Oligocene) - Light-gray to pinkish-gray, friable sandstone and poorly sorted, loosely cemented, boulder to pebble conglomerate mapped on the south flank of the Uinta Mountains; conglomerate beds mapped on Little Mountain consist mostly of Paleozoic and Mesozoic clasts in the lower part of the formation and become almost exclusively composed of red sandstone and quartzite (Uinta Mountain Group) clasts in the upper part; contains light-gray tuff interbeds; biotite and hornblende crystals from a tuff bed yielded K-Ar ages of about 29 Ma (Hansen, 1986); 150 m thick.

Td Duchesne River Formation (Eocene) - Reddish-brown, yellowish-gray, and greenish-gray lithic sandstone, siltstone, claystone, and conglomerate; contains well-developed paleosols; lower part of formation intertongues with underlying Uinta Formation to the south in the Uinta Basin; 270 m thick in quadrangle, but more than 1,000 m thick southward in the Uinta Basin.

Tbr Bridger Formation (Eocene) - Soft, light-green-gray, light-brown, light-gray, and pale-yellow shale, sandstone, and limestone exposed north of the Uinta Mountains; includes resistant, light-gray, light brown, and yellow-gray cobble and boulder conglomerate that forms much of Phil Pico Mountain; conglomerate clasts are subangular to subrounded, poorly sorted, and composed of conglomeratic sandstone (Gartra Member), fine-grained sandstone (Weber and Nugget Sandstones, and cherty limestone (Madison and Round Valley Limestones); 600 m thick.

Tg Green River Formation (Eocene) - Soft to moderately resistant, light- to medium-gray, light- to medium brown, yellow, and greenish-gray mudstone, organic-rich marlstone, siltstone, sandstone, and cherty limestone that likely represent the Laney Shale Member; lower part intertongues with underlying Wasatch Formation and the upper part intertongues with the overlying Bridger Formation north of Uinta Mountains; 90-250 m thick in the quadrangle, but is much thicker in the basins north and south of the Dutch John quadrangle.

Tw Wasatch Formation (Eocene) - Red, yellow, and gray friable sandstone, siltstone, claystone, and conglomerate; upper part intertongues with overlying Green River Formation in Green River Basin north of Dutch John quadrangle; conglomerate clasts consist of mostly gray limestone (Paleozoic), sandstone (Mesozoic), and some red sandstone and quartzite (Uinta Mountain Group); 610 m thick.

Tfu Fort Union Formation (Paleocene) - Light-gray, light-brown, light-green, and brown sandstone, shale, and claystone with some carbonaceous shale, coal, siltstone, and conglomerate beds; inverse stratigraphy of Mesozoic through Paleozoic clasts in conglomerate beds with some clasts of Uinta Mountain Group locally present; only mapped on north flank of Uinta Mountains; 365-700 m thick.

TKfz Uinta fault zone rocks (Tertiary and Upper Cretaceous) - Broken rock derived mostly from the hanging wall that ranges from recognizable rock fragments to cataclasite and gouge; the fault zone varies from a few meters to about one kilometer in width.

Ke Ericson Sandstone (Upper Cretaceous) - Resistant, light-gray, medium- to coarse-grained sandstone and lenses of conglomerate, with local thin beds of dark-gray nonmarine shale; only mapped on north flank of Uinta Mountains; 88-275 m thick.

Krs Rock Springs Formation (Upper Cretaceous) - Resistant, light-gray to pale-grayish-orange, fine-grained, cross-bedded sandstone with some carbonaceous shale and coal beds; only mapped on north flank of Uinta Mountains; 0-333 m thick.

Kbl Blair Sandstone (Upper Cretaceous) - Resistant, light-gray, pale-grayish-orange to pink, thick-bedded sandstone with interbedded gray marine shale; pinches out eastward becoming a tongue in the Baxter Shale near the Glades; only mapped on north flank of Uinta Mountains; 0-107 m thick.

Kbx Baxter Shale (Upper Cretaceous) - Gray, soft, slope-forming calcareous shale containing numerous beds of fine-grained, ripple-marked sandstone and minor limestone; equivalent of the Mancos Shale; only mapped on north flank of Uinta Mountains; 1,890 m thick.

Kms Mancos Shale (Upper Cretaceous) - Main body of the Mancos Shale; dark-gray, soft, slope-forming calcareous shale containing beds of siltstone and bentonitic clay; mapped only on south flank of Uinta Mountains; 1,500-4,900 m thick.

Kfd Frontier Sandstone, Mowry Shale and Dakota Sandstone (Upper and Lower Cretaceous) - These formations are shown as one unit on the north slope of Jessen Butte, north flank of the Uinta Mountains, because they are too thin to map separately at this scale. See below for descriptions and thickness.

Kf Frontier Sandstone (Upper Cretaceous) - Upper part resistant, light-brown to light-gray and yellow, fine-grained and ripple-marked sandstone with local petrified wood and fossils; lower part soft, light- to dark-gray calcareous shale; may include minor limestone and coal beds in the lower part; 52-83 m thick.

Kmd Mowry Shale and Dakota Sandstone undivided (Lower Cretaceous) - These formations are locally shown as one unit along the south flank of the Uinta Mountains because they are too thin to map separately at this scale. See below for descriptions and thickness.

Km Mowry Shale (Lower Cretaceous) - Dark-gray, siliceous shale that weathers silver gray; contains abundant fossil fish scales; 10-67 m thick.

Kd Dakota Sandstone (Lower Cretaceous) - Upper and lower resistant, yellow and light-gray, medium- to coarse-grained sandstone beds separated by a carbonaceous shale; contains coal beds in exposures along south flank of Uinta Mountains; 15-76 m thick.

KJcm Cedar Mountain Formation and Morrison Formation - Cedar Mountain is mapped with the underlying Morrision Formation because it is generally thin and the contact with the underlying Morrison is difficult to determine.
- Cedar Mountain Formation (Lower Cretaceous) - Purple, gray, and greenish-gray mudstone, siltstone, minor sandstone and limestone; contains calcrete beds that weather out as carbonate nodules; 0-60 m thick.
- Morrison Formation (Upper Jurassic) - Upper Brushy Basin Member consists of soft, banded, variegated (light-gray, olive-gray, red, and light-purple) shale, claystone, siltstone, and minor cross-bedded sandstone, conglomerate, and bentonite; lower Salt Wash Member consists of resistant, light-gray to white cross-bedded sandstone; Salt Wash Member may not be preserved in the Flaming Gorge area; dinosaur remains are preserved in the Salt Wash Member at Dinosaur National Monument to the southeast; 244-287m thick .

Jsc Stump Formation, Entrada Sandstone, and Carmel Formation (Upper and Middle Jurassic) -
- Stump Formation (Upper and Middle Jurassic) - Upper Redwater Member is greenish-gray and light-green slope-forming shale with glauconitic, fossiliferous (belemnites) sandstone and limestone. Lower Curtis Member is resistant, light-gray to greenish-gray, cross-bedded, fossiliferous, glauconitic sandstone, oolitic limestone, and fissile shale. The upper Curtis Member is thin or missing in the Dutch John quadrangle because of erosion prior to deposition of the overlying Morrison Formation; Stump is 40-80 m thick.
- Entrada Sandstone (Middle Jurassic) - Upper reddish-brown siltstone and fine-grained sandstone and a lower light-gray, pink, and light-brown sandstone; lower sandstone is resistant to erosion and forms cliffs and ridges; Entrada is 12-75 m thick.
- Carmel Formation (Middle Jurassic) - Medium- to dark-red, green, and gray sandy shale, sandstone, siltstone, limestone and gypsum; upper part is mostly slope-forming red shale, siltstone, and sandstone underlain by a middle gypsiferous unit; lower part is mostly ledge-forming limestone, which is commonly oolitic and fossiliferous; Carmel is 30-118 m thick.

Jg Glen Canyon/Nugget Sandstone (Lower Jurassic and Upper Triassic) - Pink, light-gray, and light-brown, resistant, large-scale cross-bedded sandstone; forms cliffs and ridges; top 2-10 m of the formation may include beds of the Middle Jurassic Page Sandstone. Dinosuar tracks of Late Triassic age are reportedly preserved in strata 7 m above the base of the Glen Canyon Sandstone in the Red Fleet area on the south flank of the Uinta Mountains (Lockley and others, 1992). These Triassic beds may only be locally preserved below the J-0 unconformity in this area. Glen Canyon beds are called the Nugget Sandstone on the north flank of the Uinta Mountains; Nugget is 248-256 m thick; Glen Canyon is 180-310 m thick.

Ꞧcd Chinle, Moenkopi, and Dinwoody Formations (Upper and Lower Triassic) - Combined as a single map unit near the Uinta fault on the north flank of the Uinta Mountains; mapped separately elsehere on the north flank; on previous maps, the Chinle beds on north flank were called the Ankareh Formation and the Moenkopi beds on north flank were called the Woodside Shale; see descriptions below for individual formations.

Ꞧmd Moenkopi and Dinwoody Formations (Lower Triassic) - Combined as a single map unit east of the Brush Creek drainage because the Dinwoody is thin (less than 10 m thick) and possibly interbedded with basal Moenkopi Formation as mapped by Hansen (1977) and Rowley and others (1981).

Ꞧc Chinle Formation (Upper Triassic) - Purplish-red, purple, light-gray, greenish-gray, light-green, ripple-marked siltstone, sandstone, claystone, shale, and conglomerate; generally forms slopes; base is resistant conglomerate unit named the Gartra Member; 83-121 m thick.

Ꞧm Moenkopi Formation (Lower Triassic) - Medium- to dark-red, reddish-brown, green, and gray, ripple-marked siltstone, fine-grained sandstone, and shale with gypsum and limestone beds; mostly soft, slope-forming unit; 170-260 m thick.

Ꞧd Dinwoody Formation (Lower Triassic) - Light-gray, greenish-gray, light-brown, and brown, thin-bedded, ripple-marked shale, siltstone, and sandstone with minor amounts of limestone. Mostly a soft, slope-forming unit mapped along the south flank of the Uinta Mountains in the Ashley and Brush Creek drainages. The Dinwoody Formation thins to the west of the Ashley Creek drainage and is represented only by gypsum beds. It is not preserved in and west of the Dry Creek drainage; 0-162 m thick.

Ppc Park City and Phosphoria Formations (Lower Permian) - Combined thickness of Park City and Phosphoria Formations is 20-122 m.
- Franson Member of Park City Formation - Gray, thick- to thin-bedded cherty limestone and dolomite interbedded with brownish-gray sandstone and red to ochre shale; generally resistant and form ledges and cliffs.
- Meade Peak Phosphatic Shale Member of the Phosphoria Formation - Slope-forming, dark-gray phosphatic shale with interbeds of sandstone and limestone.
- Grandeur Member of Park City Formation - Light-gray to light-brownish-gray sandstone, dolomite, and limestone; generally resistant and form ledges and cliffs.

PIPw Weber Sandstone (Lower Permian to Middle Pennsylvanian) - Light-gray to yellowish-gray, very thick bedded sandstone with interbeds of limestone in the lower part; highly cross-bedded sandstone in the upper part; forms steep cliffs and ridges; 230-472 m thick.

IPMu Pennsylvannian and Mississippian rocks, undivided - Small fault blocks of carbonate rocks likely from the Round Valley and Madison Limestones along the Uinta fault zone.

IPm Morgan Formation (Middle Pennsylvanian) - Light- to medium-red, yellow, and gray shale and siltstone, light- to medium-gray fossiliferous and red cherty limestone, and light-red-gray, fine-grained, locally cross-bedded sandstone; 11-290 m thick.

IPrv Round Valley Limestone (Lower Pennsylvanian) - Light-gray to light-blue-gray, thin- to very thick bedded limestone interbedded with soft, red shale; limestone is fossiliferous and cherty; chert is blue gray and yellowish gray, but red to pink jasperoid chert is common in the region; forms ledges and cliffs; 65-127 m thick.

Mdh Doughnut Shale and Humbug Formation (Upper Mississippian) - Thickness of map units is 160-181 m.
- Doughnut Shale - Dark-gray shale, with some red shale near base, with beds of coarse sandstone, limestone and coal; shale is slope forming and clayey; 85-91 m thick.
- Humbug Formation - Light-gray to red, fine-grained to very fine grained, soft to resistant sandstone interbedded with light-gray limestone and red to black shale; sandstone is locally cross-bedded and hematitic near top of formation; may contain caves and sinkholes along the south flank of the Uinta Mountains; 75-90 m thick.

Mm Madison Limestone (Upper and Lower Mississippian) - Mostly dark-gray, medium to coarse crystalline, cherty limestone; chert is typically light gray; commonly contains numerous caves and sinkholes; 130-300 m thick.

Ꞓl Lodore Formation (Upper Cambrian) - Light-brown to greenish-gray sandstone underlain by pink to tan to pale-greenish-gray glauconitic shale interbedded with tan to pale-green sandstone; base is variegated (pink, gray, and pale-green) coarse- to medium-grained cross-bedded sandstone; locally pebbly; upper part forms ledges, middle part forms slopes and ledges, and lower part forms cliffs; Lodore pinches out to the west; 0-180 m thick.

Zur Red Pine Shale of the Uinta Mountain Group (middle Upper Proterozoic) - Dark-gray to dark-green-gray shale and siltstone; interbedded with brown-gray to brown-red sandstone and quartzite, thin bedded near base becoming thick bedded near the top; sandstone is medium- to coarse-grained, cross-bedded, and siliceous; age is based on palynomorphs recovered from dark-gray shale near base of formation in Whiterocks Canyon (Sprinkel and others, 2002); exposed in the soutwest part of quadrangle; estimated at 0-550 m thick.

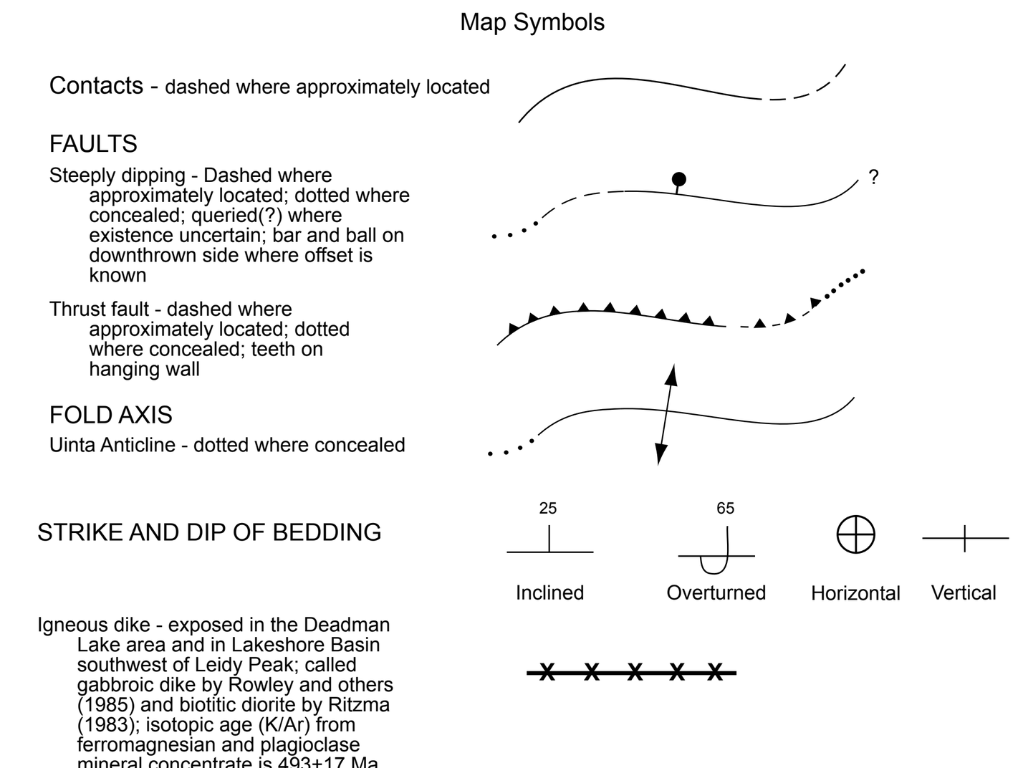
ZYuu Unnamed Formation of the Uinta Mountain Group (lower Upper Proterozoic and upper Middle Proterozoic) - Dark- to light-red, fine- to coarse-grained, quartzose and lithic sandstone and quartzite, sandstone is thick- to medium-bedded; planar-, cross-, and contorted-bedding is preserved; some beds contain tool and groove marks, ripples, and mudcracks; contains considerable red, green, and dark-gray micaceous shale interbeds and some conglomerate; age is based on palynomorphs recovered from dark-gray shale from near middle of formation at Leidy Peak and from water wells at Red Springs (Sprinkel and others, 2002); as much as 3,500 m thick.

Yuj Jesse Ewing Canyon Formation of the Uinta Mountain Group (Middle Proterozoic) - Dark- to light-red, brown, and reddish-purple pebble to boulder conglomerate interbedded with quartzose and lithic sandstone and shale; clasts are white, pale green, and pink quartzite (from Red Creek Quartzite), subrounded to subangular; thick- to medium-bedded and fining up in individual beds as well as the formation as a whole; age is based on palynomorphs recovered from a dark-gray shale bed (Sprinkel and others, 2002) preserved in a down-faulted block defined as basal Jesse Ewing Canyon Formation by Sanderson and Wiley (1986) but mapped as the overlying unnamed formation for this compilation; 225 m thick.

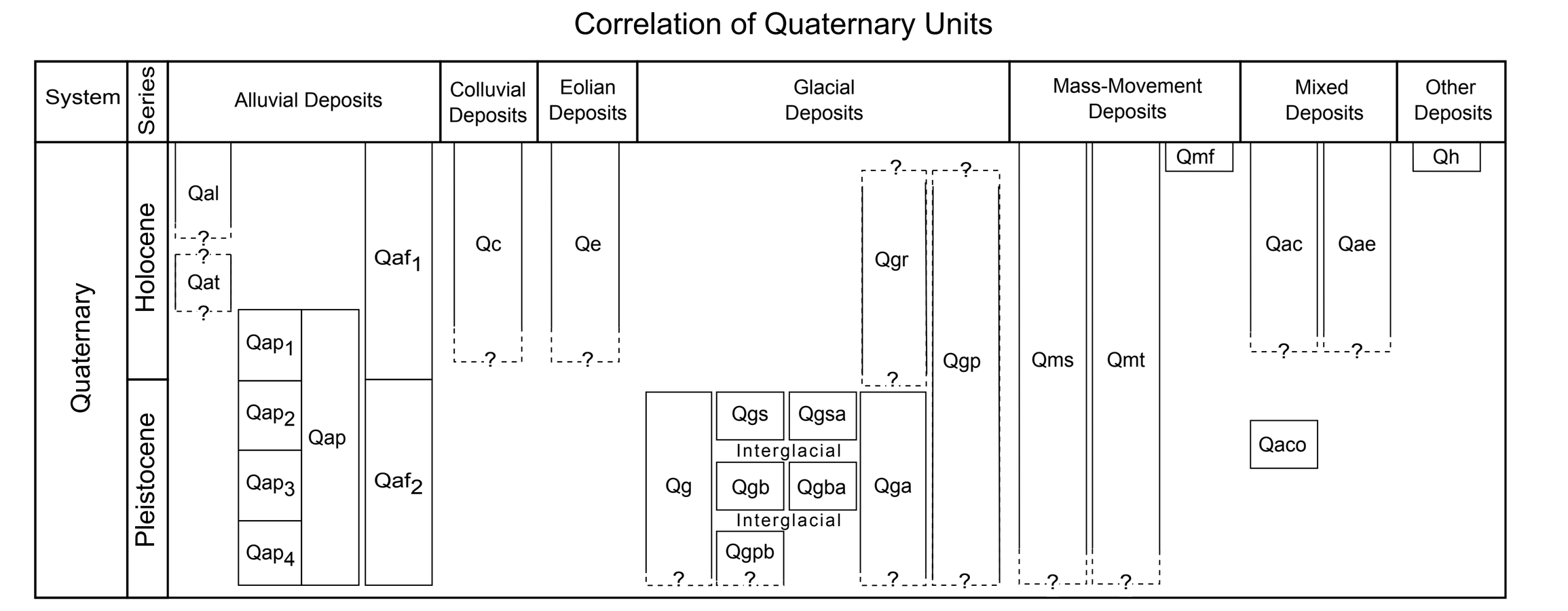
YXra, XWrq, XWrm, XWre, XWrc Red Creek Quartzite (Middle Proterozoic to Upper Archean) - Contains three main rock types: metaquartzite, mica schist, and amphibolite; other minor rock types include metadiorite and metacarbonate to marble. Map unit as much as 6,096 m thick.
- Amphibolite (YXra) - Dark-gray to black, fine- to medium-grained amphibolite composed of strongly foliated to non-foliated metamorphosed mafic rocks, mostly hornblende; intruded into and intimately associated with the Red Creek Quartzite as numerous small bodies in the northeast part of the quadrangle.
- Metaquartzite (XWrq) - Resistant white, gray, tan, and light-green metaquartzite.
- Mica schist (XWrm) - Quartz-muscovite schist that grades between metaquartzite and mica schist and contains garnet and staurolite.
- Metadiorite (XWre) - Metamorphosed diorite; epidiorite of previous mappers.
- Carbonate rock (XWrc) - Metamorphosed carbonate rock along Goslin fault.

Wo Owiyukuts Complex (Upper Archean) - High-grade, metamorphosed potassium-rich granitic gneiss and lesser quartzofeldspathic gneiss;Rb/Sr age 2,700 Ma, but Houston and others (1993) report that the age could be as young as 1,800 Ma; unknown thickness.

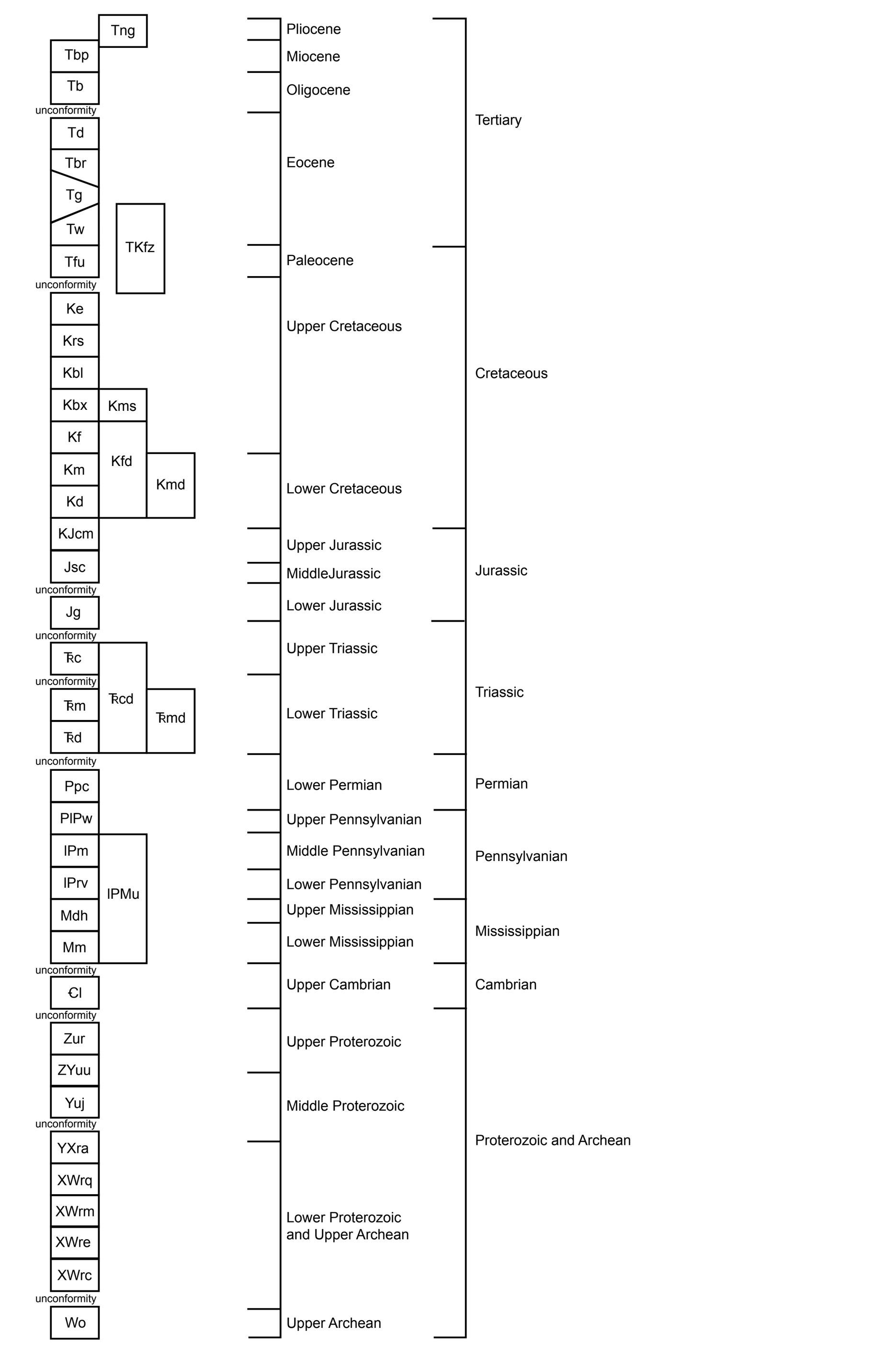
Map Symbols



Correlation of Quaternary Units



Correlation of Bedrock Units



Stratigraphic Column for North Flank of the Uinta Mountains

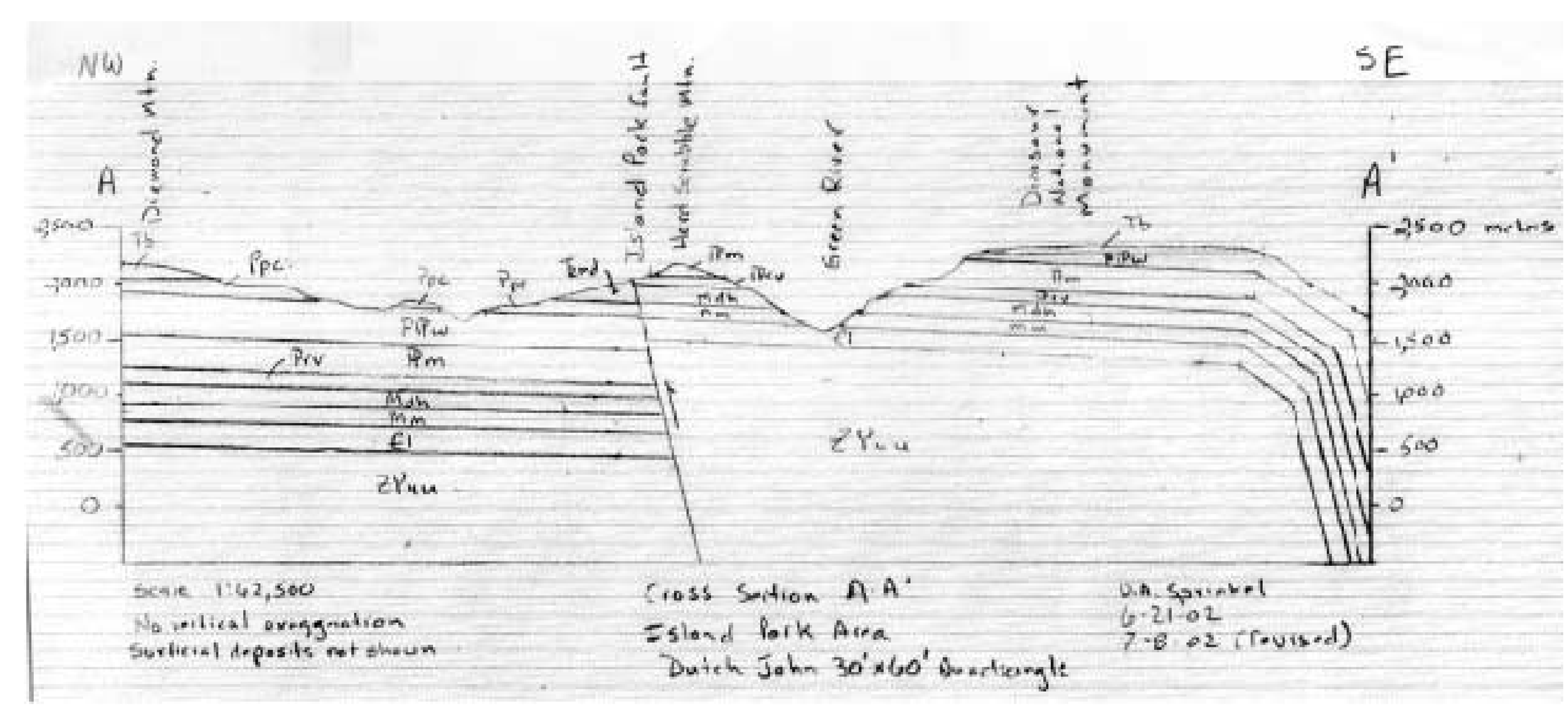
SYSTEM	SYMBOL	FORMATIONS	Thickness (meters) (not to scale)	NOTES
Quat.	Q*	Unconsolidated deposits	less than 50	Alpine glaciers in Uinta Mountains. Capture of Green River by Colorado River
Tertiary	Tng	Old gravel deposits	less than 50	Crustal relaxation; Uinta Mountains down dropped along Uinta fault zone and drainage patterns change in eastern Uintas.
	Tbp	Browns Park Formation	0-500	
	Tbr	Bridger Formation	600	Crustal stability; Gilbert Peak erosion surface forms and Bishop Conglomerate is deposited
	Tg	Green River Formation	90-250	
	Tw	Wasatch Formation	610	Uinta Mountains continue to uplift and erosion exposed Uinta Mountain Group
	Tfu	Fort Union Formation	365-700	Unconformity, 6 m.y.; TK boundary and the extinction of dinosaurs
Cretaceous	Ke (Mesaverde Group)	Ericson Sandstone	88-275	Uplift of Uinta Mountains begins near end of Cretaceous
	Krs (Mesaverde Group)	Rock Springs Formation	0-333	Strata thin to east
	Kbl (Mesaverde Group)	Blair Sandstone	0-107	End of great Western Interior Seaway
	Kbx	Baxter Shale	1,890	Hilliard Shale of some previous workers
	Kfd: Kf	Frontier Sandstone	52-58	Gas reservoir at Clay Basin; Unconformity, 5 m.y.
	Kfd: Km	Mowry Shale	61-67	Fossil fish scales in Mowry
	Kfd: Kd	Dakota Sandstone	40-76	Gas reservoir at Clay Basin; K-1 unconformity, 2 m.y.
	KJcm	Cedar Mountain Formation	0-60	K-0 unconformity, 25 m.y.
Jurassic	KJcm	Morrison Formation	244-287	Abundant dinosaur remains; J-5 unconformity, 2 m.y.
	Jsc	Stump Formation	44-55	*Belemnites* fossils
	Jsc	Entrada Sandstone	61-75	J-3 unconformity, 1 m.y.
	Jsc	Carmel Formation	53-101	*Pentacrinus* fossils
	Jg	Nugget Sandstone	248-256	J-2 unconformity, 14 m.y.; top of Jg may include Page Sandstone; J-0 unconformity, 7 m.y.
Triassic	Ꞧcd: Ꞧc	Chinle Formation	91-116	Ankareh and Stanaker Fm. of some workers; Gartra Member; Tr-3 unconformity, 15 m.y.
	Ꞧcd: Ꞧm	Moenkopi Formation	221	Woodside Shale of some workers
	Ꞧcd: Ꞧd	Dinwoody Formation	110-162	Tr-1 unconformity, 6 m.y.
Permian	Ppc	Park City and Phosphoria Formations	73-122	Phosphate deposits; Unconformity, 3 m.y.
	PIPw	Weber Sandstone	472	Forms cliffs and important oil reservoir in the Rocky Mountains
Penn.	IPMu: IPm	Morgan Formation	11-37	
	IPMu: IPrv	Round Valley Limestone	80-127	
Miss.	IPMu: Mdh	Doughnut Shale	91	
	IPMu: Mdh	Humbug Formation	75-90	
	IPMu: Mm	Madison Limestone	130-300	Forms cliffs, contains marine fossils; Unconformity, about 350 m.y.
Proterozoic	ZYuu	Unnamed Formation of the Uinta Mountain Group	as much as 3,500	Forms the core of Uinta Mountains; Flaming Gorge Dam constructed in this unit
	Yuj	Jesse Ewing Canyon Formation of the Uinta Mountain Group	225	Angular unconformity, about 500 m.y.
Proterozoic / Archean	YXra, XWrq, XWrm, XWre, XWrc	Red Creek Quartzite	as much as 6,096	Metamorphosed rocks that are some of the oldest in Utah
Archean	Wo	Owiyukuts Complex	Thickness Unknown	

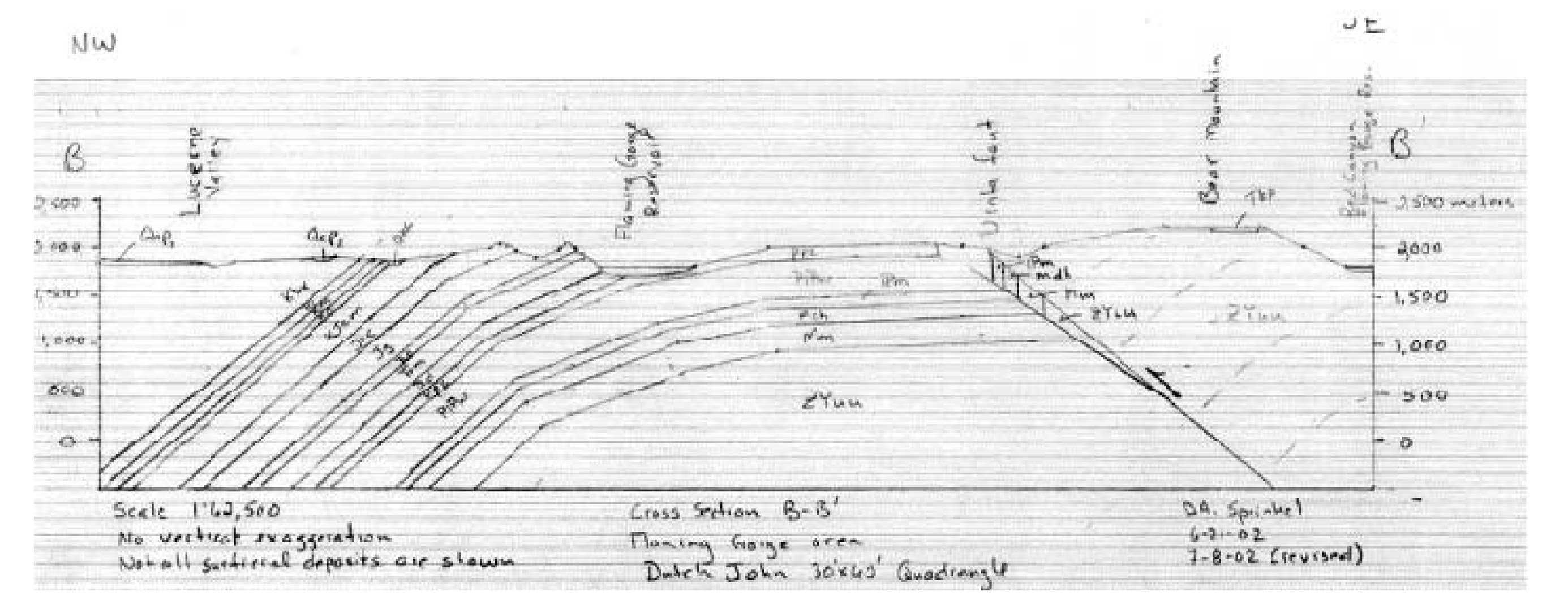
*See Correlation of Quaternary Units for symbols

Stratigraphic Column for the South Flank of the Uinta Mountains

SYSTEM	SYMBOL	FORMATIONS	Thickness (meters) (not to scale)	NOTES
Quat.	Q*	Unconsolidated deposits	less than 50	Alpine glaciers in Uinta Mountains. Capture of Green River by Colorado River
Tertiary	Tb	Bishop Conglomerate	90-150	Regional extension tilted and faulted the Bishop Conglomerate
	Td	Duchesne River Formation	270-1,000+	Crustal stability; Gilbert Peak erosion surface forms and Bishop Conglomerate is deposited. Duchesne River Formation unconformably deposited on a variety of Mesozoic formations after uplift of Uinta Mountains in Late Cretaceous through early Tertiary
Cretaceous	Kms	Mancos Shale	1,500-4,900	Mancos Shale represents last formation of great Western Interior Seaway
	Kf	Frontier Sandstone	68-83	Unconformity, 5 m.y.
	Kmd: Km	Mowry Shale	10-65	Fossil fish scales in Mowry
	Kmd: Kd	Dakota Sandstone	15-60	K-1 unconformity, 2 m.y.
	KJcm	Cedar Mountain Formation	0-60	K-0 unconformity, 25 m.y.
Jurassic	KJcm	Morrison Formation	244-270	Abundant dinosaur remains; J-5 unconformity, 2 m.y.
	Jsc	Stump Formation	40-80	*Belemnites* fossils
	Jsc	Entrada Sandstone	12-75	J-3 unconformity, 1 m.y.
	Jsc	Carmel Formation	30-118	*Pentacrinus* fossils
	Jg	Glen Canyon Sandstone	180-310	J-2 unconformity, 14 m.y.; top of Jg may include Page Sandstone; base may locally contain Triassic beds; J-0 unconformity, <7 m.y.; Triassic dinosaur tracks near base of Jg
Triassic	Ꞧc	Chinle Formation	83-121	Gartra Member; Tr-3 unconformity, 15 m.y.
	Ꞧmd: Ꞧm	Moenkopi Formation	170-260	Pinches out westward
	Ꞧmd: Ꞧd	Dinwoody Formation	0-50	Tr-1 unconformity, 6 m.y.
Permian	Ppc	Park City and Phosphoria Formations	20-60	Phosphate deposits; Unconformity, 3 m.y.
	PIPw	Weber Sandstone	230-350	Forms cliffs and important oil reservoir in the Rocky Mountains
Penn.	IPm	Morgan Formation	190-290	
	IPrv	Round Valley Limestone	65-120	
Miss.	Mdh	Doughnut Shale	85-91	
	Mdh	Humbug Formation	75-90	
	Mm	Madison Limestone	180-300	Forms cliffs, contains marine fossils; Unconformity, 136 m.y.
CAMBRIAN	Ꞓl	Lodore Formation	0-180	Thins westward; Unconformity, about 220 m.y.
Proterozoic	Zur	Red Pine Shale	0-550	
	ZYuu	Unnamed Formation of the Uinta Mountain Group	as much as 3,500	Forms the core of the Uinta Mountains; Flaming Gorge Dam constructed in this unit

*See Correlation of Quaternary Units for symbols





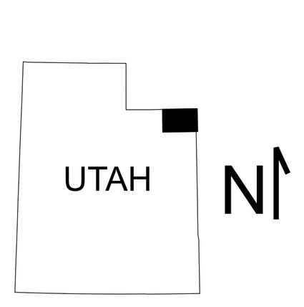
Sources of Geologic Mapping and Index to U.S. Geological Survey 7.5-minute Quadrangles in the Dutch John 30' x 60' Quadrangle

110° — 109°; 41° — 40° 30'

Phil Pico Mtn. Anderman (1955); Bradley (1988); Sprinkel (new mapping)	**Jessen Butte** Anderman (1955); Sprinkel and Jensen (new mapping)	**Manila** Anderman (1955); Hansen and Bonilla (1956); Hansen (1965)	**Flaming Gorge** Anderman (1955); Hansen (1962, 1965)	**Dutch John** Hansen (1961b, 1965)	**Goslin Mtn.** Hansen (1961b, 1965)	**Clay Basin** Hansen (1957, 1965)	**Willow Creek Butte** Hansen (1961a, 1965)
Whiterocks Lake Sprinkel (new mapping)	**Leidy Peak** Sprinkel (new mapping)	**Elk Park** Sprinkel (new mapping)	**East Park Reservoir** Sprinkel (new mapping)	**Mount Lena** Sprinkel (new mapping)	**Jackson Draw** Sprinkel (new mapping)	**Warren Draw** Hansen (1965); Sprinkel (new mapping)	**Swallow Canyon** Hansen (1965); Sprinkel (new mapping)
Paradise Park Sprinkel (new mapping)	**Marsh Peak** Sprinkel (new mapping)	**Taylor Mtn.** Kinney (1955); Munroe (2000); Sprinkel (new mapping)	**Dyer Mountain** Kinney (1955); Sprinkel (new mapping)	**Burnt Cabin Gorge** Kinney (1955); Sprinkel (new mapping)	**Blair Basin** Kinney (1955); Sprinkel (new mapping)	**Crouse Reservoir** Hansen and others (1981)	**Hoy Mountain** Hansen and Rowley (1991)
Ice Cave Peak Kinney (1955); Sprinkel (new mapping)	**Lake Mountain** Kinney (1955); Sprinkel (new mapping)	**Dry Fork** Kinney (1955); Sprinkel (new mapping)	**Steinaker Reservoir** Kinney (1955); Sprinkel (new mapping)	**Donkey Flat** Kinney (1955); Sprinkel (new mapping)	**Jensen** Kinney (1955); Sprinkel (new mapping)	**Island Park** Rowley and others (1981)	**Jones Hole** Hansen (1977)

Additional references include Schell (1969), Schell and Dyni (1973), and Graff and others (1980).

Scale: 0 — 25 — 50 miles; 0 — 40 — 80 kilometers



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Updated July 8, 2002